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A Shovel-Tusked Mastodon, *Amebelodon Fricki*, from Kansas

BY ERWIN HINCKLEY BARBOUR AND CLAUDE W. HIBBARD

SINCE the Amebelodontinae were first announced (Barbour 1927), a number of examples of the genus *Amebelodon* have presented themselves in various parts of Nebraska, Colorado, and in several places in Kansas. Thus its range has already been materially extended, many skeletal parts added, and the hope kindled that knowledge of this remarkable group of proboscideans is destined to be greatly enriched within the next few years. As may be seen in the accompanying lists of the known parts of *Amebelodon* preserved in various museums, there are already at hand the bones necessary for the assemblage of a nearly complete composite skeleton from which a fair restoration of the creature in life could be drawn. Furthermore it may be predicted that many other species of the amebelodonts and platybelodonts are sure to be found and published.

The *Amebelodon* specimens from Kansas herein described and figured comprise portions of the mandible, the two great mandibular tusks, the upper dentition complete and unmarred together with unrelated stray teeth. These parts contribute fundamentally to a better understanding of the excellent amebelodont material in the paleontological collections of the late Honorable Charles H. Morrill, University of Nebraska State Museum. Specimens under consideration were found in the Rhino Hill quarry, Wallace county, on the Colorado-Kansas line, in sec. 11, T. 11 S., R. 38 W. on the farm of Mr. Abram Marshall, 19 miles NE of Wallace, Kansas.

Mandibular Tusks.—The right and left tusks were found in association and undoubtedly are a pair, fig. 15. Of the two mandibular tusks, the right is slightly larger throughout than the left,

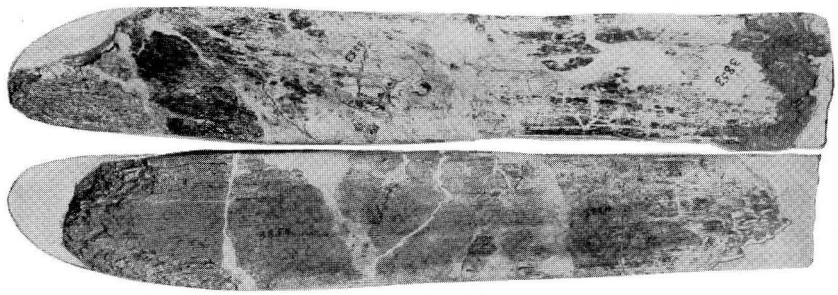

Fig. 15.—Anterior tips of the two mandibular tusks of *Amebelodon fricki,* K.U.M. 3853 and 3854. Both tusks exhibit dentinal conules, but the left the better.

due plainly to crushing and flattening. They are very similar in size and shape to those of the type specimen, *Amebelodon fricki,* although not quite as large.

The right tusk, numbered K.U.M. 3853, is a fragment 670 mm. (26⅜ inches) long by 130 mm. (5⅛ inches) wide, that of the type being 140 mm. (5½ inches) wide. The average thickness of the inner border is 46 mm. (1½+ inches), that of the type 51 mm. (2 inches).

The left mandibular tusk of *Amebelodon fricki,* K.U.M. 3854 is shown in figure 16 viewed on edge along the thickened and grooved inner border. This longitudinal groove does not occur in the mandibular tusks of the type specimen.

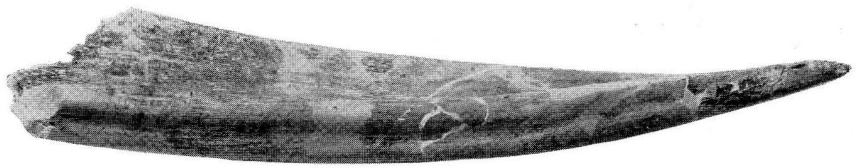

Fig. 16.—Tip end of the left mandibular tusk of *Amebelodon fricki,* K.U.M. 3854, viewed on edge along the thickened and grooved inner border. Dentinal conules shown at the fractured and weathered extremities.

Dentinal Conules.—The left tusk is sufficiently weathered, fore and aft, to expose to perfection innumerable dentinal conules, tubules, or rods. Though crowded together at the tip, they are in even greater profusion at the fractured end, fig. 17. This interesting structure, noted for the first time in bulletin 16 (volume 1), The University of Nebraska State Museum, is assumed by Osborn to be a provision for increasing the strength of the tusk.

Fig. 17.—*Amebelodon fricki*, K.U.M. 3854. Left mandibular tusk showing dentinal conules surrounded by a thin outer wall of laminated ivory and the longitudinal corrugations characteristic of the inferior tusks of the Amebelodontinae and the Platybelodontinae.

Longitudinal and transverse sections of these conules have been ground but they fail to reveal under magnification any recognizable structure, and it may be necessary to make a larger number. A section of the tusk itself shows a thin bounding wall of laminated dentine or ivory surrounding an interior bundle of these conules, which average in diameter an eighth of an inch with a maximum of three-eighths and with an undetermined length. The dentinal conules are known to have extended throughout the anterior half and perhaps throughout the entire length of the tusk. The fact that they are so well represented in some cases and so poorly in others remains to be explained.

Palatine Region.—The restored palate and maxillae of this specimen, fig. 18, exhibit two rows of cheek teeth, each row notably long, 387 mm. (15¼ inches). These are parallel, not flaring according to rule. Fortunately all the grinders of this fine specimen are present and unblemished.

Molar Teeth.—As may be seen in the accompanying figures 18 and 19, the upper molars are without cracks, scratches, or imper-

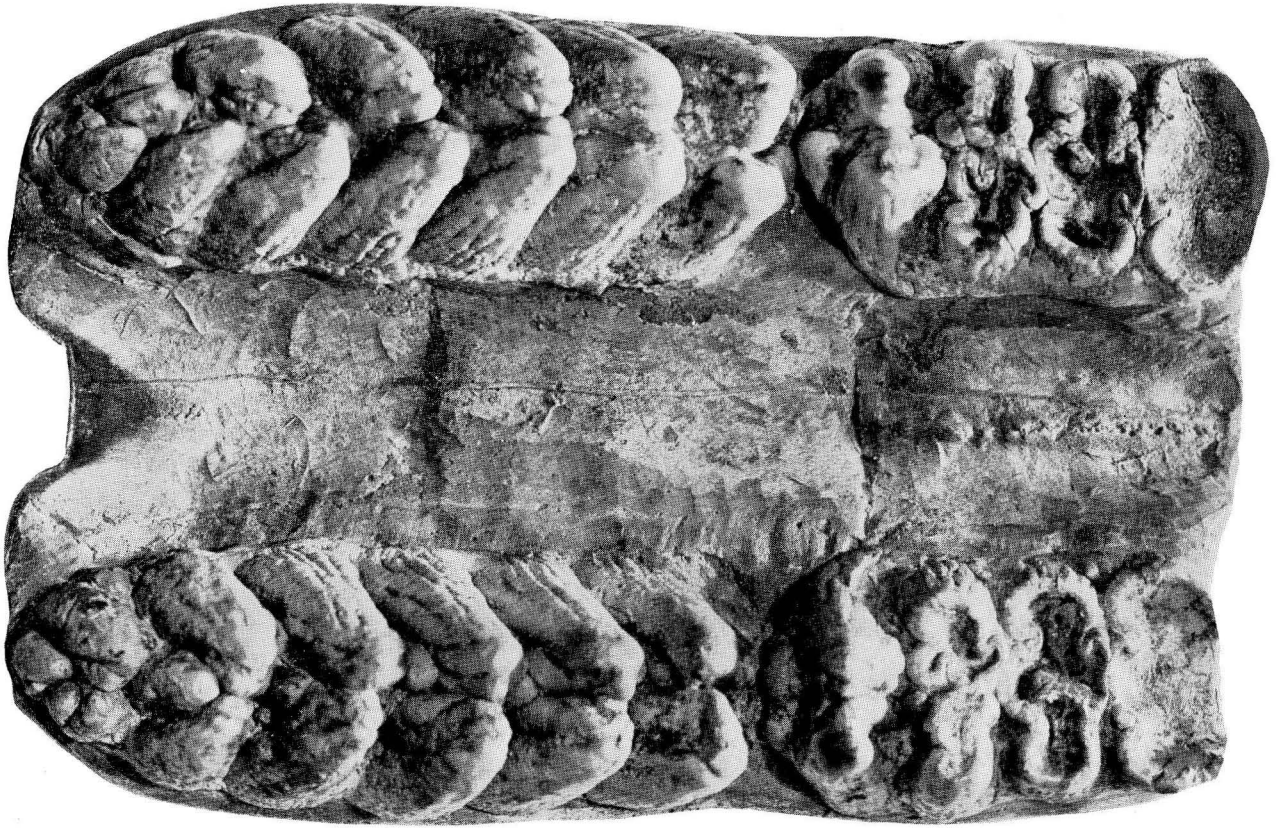

Fig. 18.—Palatine view of the molars of *Amebelodon fricki*, K.U.M. 3852, Wallace county, Kansas. Palate restored. ⅔ natural size.

Fig. 19.—Right upper molars of *Amebelodon fricki*, inner view showing deeply corrugated high-crowned cheek teeth. K.U.M. 3852, Wallace county, Kansas.

fections of any nature whatever and the halftone illustrations give clearly defined and reliable views of the cheek teeth. As far as can be learned, these are the first upper molars of *Amebelodon* to have been found and figured.

The molars are encircled by a cingulum which is generously developed, and well marked by cones especially on the inner border. The second molar, M^2, has four coarse, trefoiled lophs or grinding ridges and a heel and is considerably worn. The length of the tooth is 150 mm. (5⅞ inches), width 87 mm. (3⅜ inches), and height 49 mm. (1⅞ inches).

The third molar, M^3, shows little if any wear and exhibits six coarse lophs and a heel. The grinding ridges are composed of strong inner and outer cones with smaller intermediate ones. The cones, especially on the inner border, are so deeply and regularly corrugated as to constitute apparently a diagnostic character. The enamel of these teeth is thick and whitish and in the valleys there is a little scattered cement not shown in the halftone. The length of this molar is 236 mm. (9¼ inches), the width at base 89 mm. (3½ inches) narrowing to 40 mm. (1½ inches) at the crown, and the height at the inner border 83 mm. (3¼ inches).

Although the Amebelodontinae have been too recently announced to expect startling progress, the advance already made seems to be satisfactory and worth recording. Four species of Amebelodons, namely: *fricki, sinclairi, hicksi,* and *paladentatus,* are known. A fifth based on a new complete mandible from Nebraska will be added as soon as the facts can be published. Just how many skeletal parts have found their way to the various museums is unknown at this writing. Information on this subject would be welcomed. In Kansas and Nebraska, which may have been the center of amebelodont population, the greatest number of specimens seems to have been found.

MEASUREMENTS

Palate, length of two cheek teeth M^2 and M^3 ..... 387 mm. (15¼ inches)

MOLARS

K.U.M. 3852 M^2 anteroposterior	150 mm.	(5⅞ inches)
Height of crown ...	49 mm.	(1⅞ inches)
Width at base	90 mm.	(3½ inches)
Width at crown	74 mm.	(2⅞ inches)
M^3 anteroposterior	237 mm.	(9¼ inches)
Height inner border	89 mm.	(3½ inches)
Width at base	89 mm.	(3½ inches)
Width at crown	38 mm.	(1½ inches)

MANDIBULAR TUSKS

K.U.M. 3853 Right tusk fragment, length.....	670 mm.	(26⅜ inches)
Average width.....	130 mm.	(5⅛ inches)
Width of type	140 mm.	(5½ inches)
Average thickness of inner border.....	40 mm.	(1½ inches)
Type, average thickness of inner border.....	51 mm.	(2 inches)
K.U.M. 3854 Left tusk fragment, length.....	591 mm.	(23¼ inches)
Width	119 mm.	(4⅝ inches)
Average thickness of inner border.....	42 mm.	(1⅝ inches)

AMEBELODONTS IN THE DENVER MUSEUM OF NATURAL HISTORY

Two excellent mandibles from near Wray, Yuma county, Colorado, are preserved in the Denver Museum of Natural History. These were named *Trilophodon hicksi* and *Trilophodon paladentatus,* respectively. In the meantime these have been referred by Osborn to *Amebelodon* as follows:

(1) *Amebelodon (Trilophodon) hicksi,* mandible with tusks and teeth, No. 310, Wray, Yuma county, eastern Colorado.

(2) *Amebelodon (Trilophodon) paladentatus,* mandible with the symphysis and the left tusk missing, No. 311, Wray, Yuma county, Colorado.

AMEBELODONTS IN THE MUSEUM OF THE UNIVERSITY OF KANSAS

A list of the amebelodont material found in Kansas and preserved in the University Museum is as follows:

(1) *Amebelodon fricki,* 3852, left and right molars 2 and 3, with palate restored, Rhino Hill quarry, SE¼ of NE¼, sec. 11, T. 11 S., R. 38 W., Wallace county, Kansas, collected the summer of 1928 by H. T. Martin and party. Middle Pliocene.

(2) *Amebelodon,* mandibular tusks right and left, 3853 and 3854, Rhino Hill quarry, Wallace county, Kansas. Middle Pliocene.

(3) *Amebelodon,* 3477, referred, palate of a young individual with molars complete, Rhino Hill quarry, Wallace county, Kansas. Middle Pliocene.

(4) *Amebelodon,* 2865 and 3858, molars, Rhino Hill quarry.

(5) *Amebelodon,* 2864, part of right mandible with molar in place, from a sandpit 2 miles north of Wakeeney, Trego county, Kansas. Middle Pliocene.

(6) *Amebelodon,* 2863, large fragment of mandible with left molar found 8 miles northwest of Ashland, Clark county, Kansas. Middle Pliocene.

(7) Molars, 3760 and 3761, type locality of Ogallala group, Feldt Ranch, 2 miles east and ½ mile north of Ogallala, Keith county, Nebraska. Middle Pliocene.

AMEBELODONTS IN THE MCPHERSON COLLEGE MUSEUM, KANSAS

The Museum of McPherson College, McPherson, Kansas, possesses several skeletal parts of *Amebelodon* including most of an extra large mandible and certain vertebrae found by Mr. Richard Granson in a gravel pit 5 miles northwest of Canton, McPherson county, central Kansas. These were collected, described and figured by Professor R. E. Mohler. These parts have been referred to *Amebelodon fricki* although they seem to be uncommonly large, show certain differences, and may prove to be a distinct species. The following is a list of the *Amebelodon* specimens in the McPherson College Museum:

(1) Mandible, extra large, with teeth and tusks. Restored and mounted.

(2) Two cervical vertebrae in fine preservation.

(3) Two thoracic vertebrae in fine preservation.

(4) Stray fragments.

AMEBELODONTS IN THE UNIVERSITY OF NEBRASKA STATE MUSEUM, THE MORRILL PALEONTOLOGICAL COLLECTIONS

In the University of Nebraska State Museum the following specimens are represented:

(1) *Amebelodon fricki,* complete mandible, No. 4-4-27 (type), Frontier county, Nebraska.

(2) *Amebelodon* specimens No. 5-8-31 from Amebelodon quarry No. 2, Cambridge, Furnas county, 8 miles south of the type quarry. This material furnishes an unusual series of skeletal parts as follows: atlas, axis and 10 other vertebrae, numerous ribs and rib fragments, scapula, humerus, radius, ulna, two femora, and stray parts.

(3) *Amebelodon* sp., mandible with tusks and teeth complete, No. 16-4-33, Garden county, Nebraska. Undescribed.

(4) Large mandible, No. 1-28-6-37 with tusks and teeth from northwest of Oshkosh, Garden county, Nebraska.

(5) *Amebelodon sinclairi,* lower left tusk, No. 1-17-7-28, Frontier county, Nebraska.

(6) *Amebelodon,* right mandibular tusk, No. 1-30-9-36, Morrill county, Nebraska.

(7) *Amebelodon,* left mandibular tusk, No. 3-30-9-36, Morrill county, Nebraska.

(8) Young *Amebelodon,* distal end of mandible with two tusks, No. 5-19-5-36, Clark county, Kansas.

(9) *Amebelodon,* tip end of jaw with two tusks, No. 1-5-8-31, Furnas county, Nebraska.

(10) *Amebelodon,* tusk, No. 67-11-7-31, Smith county, Kansas.

(11) *Amebelodon,* mandibular tusk, No. 2-2-9-30, Smith county, Kansas.

(12) Five or six molars referred.

(13) *Amebelodon,* mandible and molars complete, No. 5-8-38. Tusks missing. From the Ogallala gravels, Pliocene beds between Broadwater and Lisco.

PLATYBELODONTS IN THE UNIVERSITY OF NEBRASKA STATE MUSEUM; THE MORRILL PALEONTOLOGICAL COLLECTIONS

Closely related to the amebelodonts (the shovel-tuskers), are the platybelodonts (the scoop or dredge-tuskers). Platybelodons are reported by Borissiak from Russia. A comprehensive array of forms from the Gobi Desert of Mongolia is to be found in the collections of the American Museum of Natural History. Examples found in the Nebraska State Museum are as follows:

(1) *Torynobelodon loomisi,* left mandibular tusk, No. 2-3-9-28, Harlan county, Nebraska.

(2) *Torynobelodon barnumbrowni,* mandible with tusk and cheek teeth complete, No. 1-10-7-31, Cherry county, Nebraska.

CHRONOLOGIC LIST OF THE DESCRIBED SPECIES OF MASTODONTS FROM THE PLIOCENE OF THE REPUBLICAN RIVER AREA

LONGIROSTRINAE

Tetralophodon campester Cope, 1878

"Collected by Russell S. Hill, Sappa Creek, Rawlins county, Kansas."

Holotype: A.M.N.H. Cope Coll. 8527, palate, right upper tusk, incomplete mandible without teeth. (Symphysis restored as without tusks and regarded by Cope as probably tuskless.)

Blickotherium euhypodon (Cope), 1884

"Collected in Trail Canyon, south fork of Driftwood creek, Hitchcock county, Nebraska. The type was discovered by one of Cope's col-

lectors, Frank Hazard, near Culbertson, Hitchcock county, Nebraska, on March 23, 1880, and was worked out during the succeeding fortnight, March 23 to April 6, as shown in the Hazard diary now preserved in the American Museum with the Cope Collection."

Holotype: A.M.N.H. Cope Coll. 8528, left ramus with M_3, palate with right and left M^3, two upper and two lower tusks.

Trilophodon dinotherioides Andrews, 1909

"Collected by Mr. C. H. Sternberg in the Loup Fork beds of northwestern Kansas."

Holotype: Brit. Mus. M.9778, a fairly complete mandible with symphysial region incomplete.

Tetralophodon elegans (Hay), 1917

"Found about 1908 near McPherson, Kansas, in a sand pit at a depth of about 35 feet in section 34, T. 19 N., R. 3 W." (Hay.) Age regarded as Pleistocene by Hay, as middle (?) Pliocene by Osborn.

Holotype: U.S.N.M. 8255, "a lower left third molar."

Serridentinus progressus (Osborn), 1923

Collected on Driftwood creek, Hitchcock county, Nebraska (previously figured by Cope as *Tetrabelodon proavus*).

Holotype: A.M.N.H. Cope Coll. 8529, left ramus with M_3 and partial symphysis.

Ocalientinus (Serridentinus) republicanus Osborn, 1926

Collected in the Pliocene of northwestern Kansas.

Holotype: A.M.N.H. 8536, left ramus with M_1-M_3.

AMEBELODONTINAE

Amebelodon (Trilophodon) hicksi Cook, 1922

Collected near Wray, Yuma county, Colorado.

Holotype: Colo. Mus. Nat. Hist. 310, mandible with symphysis and lower tusks, and last lower molars on each side.

Amebelodon (Trilophodon) paladentatus Cook, 1922

Collected near Wray, Yuma county, Colorado.

Holotype: Colo. Mus. Nat. Hist. 311, incomplete mandible with right lower tusk but without symphysis.

Amebelodon fricki Barbour, 1927

From near Freedom, Frontier county, Nebraska, on the farm of Mr. Alexander Keith.

Holotype: N.S.M. 4-4-27, complete mandible with symphysis and lower tusks, right and left M_3.

Amebelodon sinclairi Barbour, 1930

From near Freedom, Frontier county, Nebraska, on the farm of Alexander Keith.

Holotype: N.S.M. 1-17-7-28, right lower tusk.

PLATYBELODONTINAE

Torynobelodon loomisi Barbour, 1929

From Sand Canyon, just east of Indian Hill, 2½ miles southwest of Republican City, Nebraska.

Holotype: N.S.M. 2-3-9-28, portion of left lower tusk.

Gnathabelodon thorpei Barbour and Sternberg, 1935

Collected ¼ mile north, 1½ miles due east of Ogallah, Trego county, western Kansas, found by Robert Arnold on his ranch, sec. 24, T. 12 S., R. 22 W., about 20 miles west and 3 miles north of Hays, Kansas.

"The specimen was found in a coarse cross-bedded channel gravel about 12 to 14 feet below the surface . . . A section at this spot shows 4 feet of dark clayey soil, and 22 feet of coarse cross-bedded channel gravel, with the skull and mandible near the middle."

Holotype: Fort Hays Kansas State College, mandible with right and left M_3, and symphysis without tusks; also associated M^3.

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